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MESSENGER III

CITIZENS RADIO

TRANSCEIVER

SERVICE AND ALIGNMENT INSTRUCTION MANUAL

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MESSENGER III

SERVICE AND ALIGNMENT INSTRUCTION MANUAL

Table of Contents

		Page No.
SECTION 1.	SPECIFICATIONS	
	A. Receiver	- 2 -
	B. Transmitter	- 2 -
	C. Power Supplies	- 2 -
	D. Messenger III Accessories	- 2 -
SECTION 2.	MAINTENANCE	
	A. Chassis Removal	- 3 -
	B. Speaker Removal	- 3 -
	C. Channel Selector Dial Replacement	- 3 -
	D. Dial Lamp Replacement	- 3 -
SECTION 3.	RECEIVER TROUBLE SHOOTING - ALIGNMENT	
	A. Equipment Required	- 5 -
	B. Test Equipment Set Up	- 5 -
	C. Preliminary Receiver Checks	- 5 -
	D. A. G. C. Section	- 6 -
	E. Squelch Section	- 6 -
	F. Audio Section	- 6 -
	G. 2nd I. F. Section	- 9 -
	H. 1st I. F. Section	- 9 -
	I. R. F. Amplifier - 1st Mixer Section	-10 -
SECTION 4.	TRANSMITTER TROUBLE SHOOTING	
	A. Equipment Required	-10 -
	B. Test Equipment Set Up	-11 -
	C. Preliminary Transmitter Checks	-11 -
	D. Initial Transmitter Adjustments	-11 -
	E. Oscillator Stage	-11 -
	F. Driver Stage	-13 -
	G. Power Amplifier Stage	-13 -
	H. Notching	-13 -
PART LIST		-14-
PRINTED CIRCUIT PARTS LAYOUT		-18 -
SCHEMATIC		-19 -

LIST OF ILLUSTRATIONS

Figure 1.	Messenger III Block Diagram	- 4 -
Figure 2.	Receiver Test Equipment Set Up	- 7 -
Figure 3.	VTVM Test Assembly	- 7 -
Figure 4.	D. C. Ammeter Connection To Power Cable	- 7 -
Figure 5.	A. G. C. and Audio Curve	- 8 -
Figure 6.	Oscilloscope R. F. Pickup Loop and Method of Connection	-11 -
Figure 7.	Audio Generator Connection to P3.	-12 -
Figure 8.	Transmitter Test Equipment Set Up	-12 -
Figure 9.	"Notching" Waveform	-12 -
Figure 10.	Transmitter Current - Power Curve	-11 -
Figure 11.	Printed Circuit Parts Layout	-18 -
Figure 12.	Messenger III Transceiver Schematic	-19 -

SECTION I

SPECIFICATIONS

A. Receiver

Frequency Range	26.965 - 27.255 MC
Sensitivity	+5db minimum for .5 microvolts at antenna terminals, 30% modulated at 1000 cps
Selectivity	6KC minimum at -6db
Frequency Control	.005% crystals
Spurious	Better than 70db except primary image=50db (35.7 MC)
Audio Output	3 watts minimum with 1 microvolt at antenna terminals
Antenna Input	50 ohms
Squelch Range	30 microvolts minimum
Squelch Sensitivity	Typical - less than 1 db signal increase to open
Intermediate Frequencies	4.3 MC and 455 KC - double conversion
A.G.C. Characteristics	See Figure 5

B. Transmitter

Frequency Range	26.965 - 27.255 MC
Emission	8A3
Frequency Control	.005% crystal
R.F. Power Input	5 watts maximum
R.F. Power Output	Minimum of 3 watts at 13.8 volts d.c. supply
R.F. Spurious and Harmonic attenuation	Greater than FCC and DOT requirements
Output Impedance	50 ohms
Modulation	70% minimum upward - 90% typical

C. Power Supplies

13.8 volt DC input (EIA Standard)	Receive	- .1 to .3 amps
	Transmit	- .6 amps
117 volt AC Supply 50 - 60 cps input Johnson Part #250-0823-001	Receive	- 4 watts
	Transmit	- 8 watts

D. Messenger III Accessories

1. E. F. Johnson P.A. Speaker	Part #250-0822-001
2. A. C. Power Supply	Part #250-0823-001
3. A. C. Power Supply with Tone Alert III	Part #250-0824-001
4. Tone Alert III	Part #250-0827-001

SECTION 2

MAINTENANCE

A. Chassis Removal

1. Access to the chassis is gained by removing the four screws at the rear of the cabinet.
2. Place the transceiver in an upside down position on a flat surface. Grasp the front panel and carefully withdraw the chassis assembly from the cabinet.

B. Speaker Removal

1. The speaker is held in place by three screws at the corners. The screws are removed and the speaker may be easily lifted from the chassis.

2. The two speaker leads are long enough to allow laying the speaker aside while making tests or during alignment. If complete removal is desired, disconnect the two leads at the speaker by pulling them from the terminals.
   CAUTION: If the speaker is left attached during servicing, do not place the speaker so that it can short the I.F. transformer shield cans to the chassis. To do so would short the power supply.

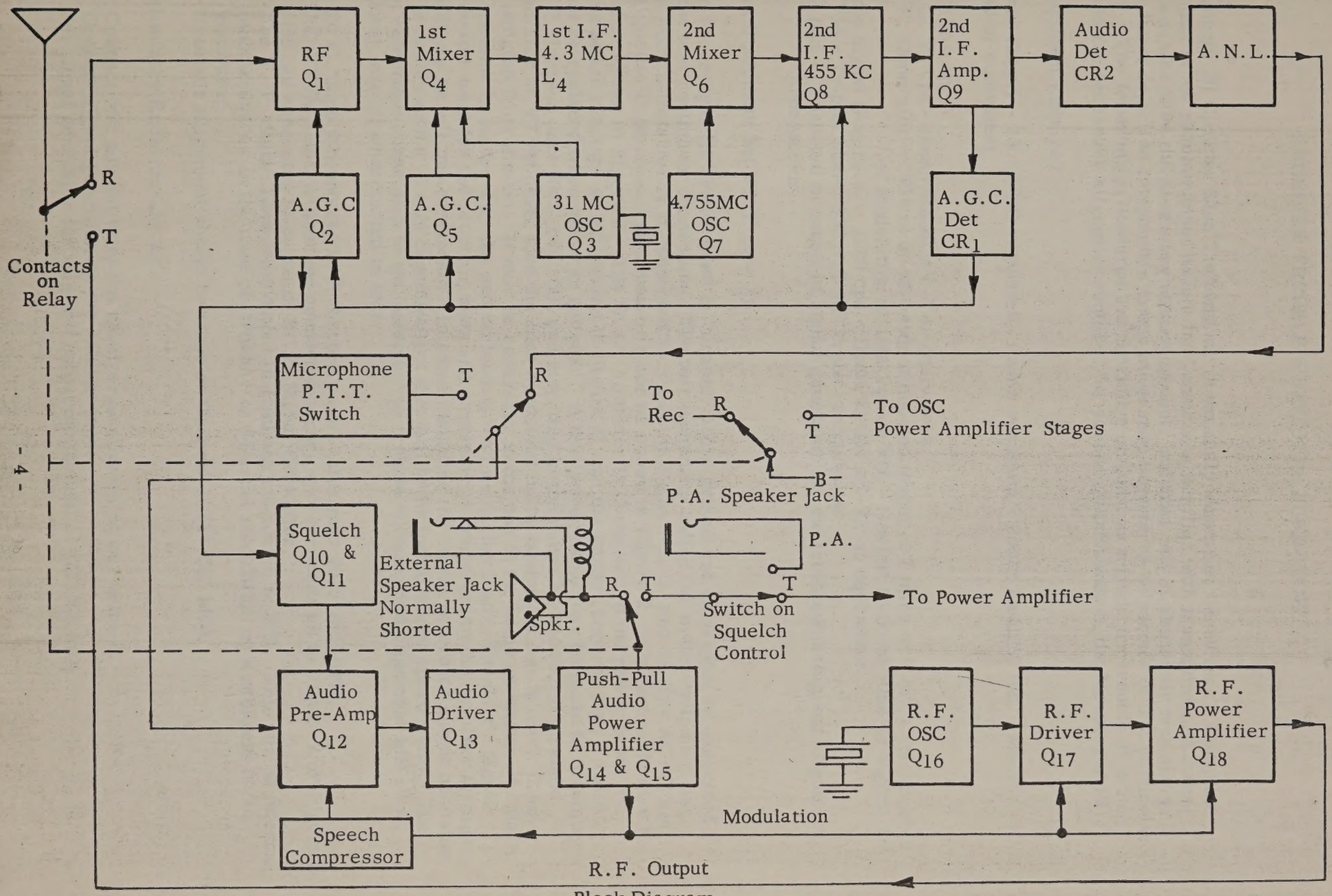
C. Channel Selector Dial Replacement

The Messenger III is supplied with an indicator dial labeled from "A" thru "K" to correspond to the eleven (11) channels. However, the Messenger III comes supplied with an extra dial indicator disc and a set of die cut numbers so the dial may be read in numbers instead of letters. The dial may be replaced as follows:

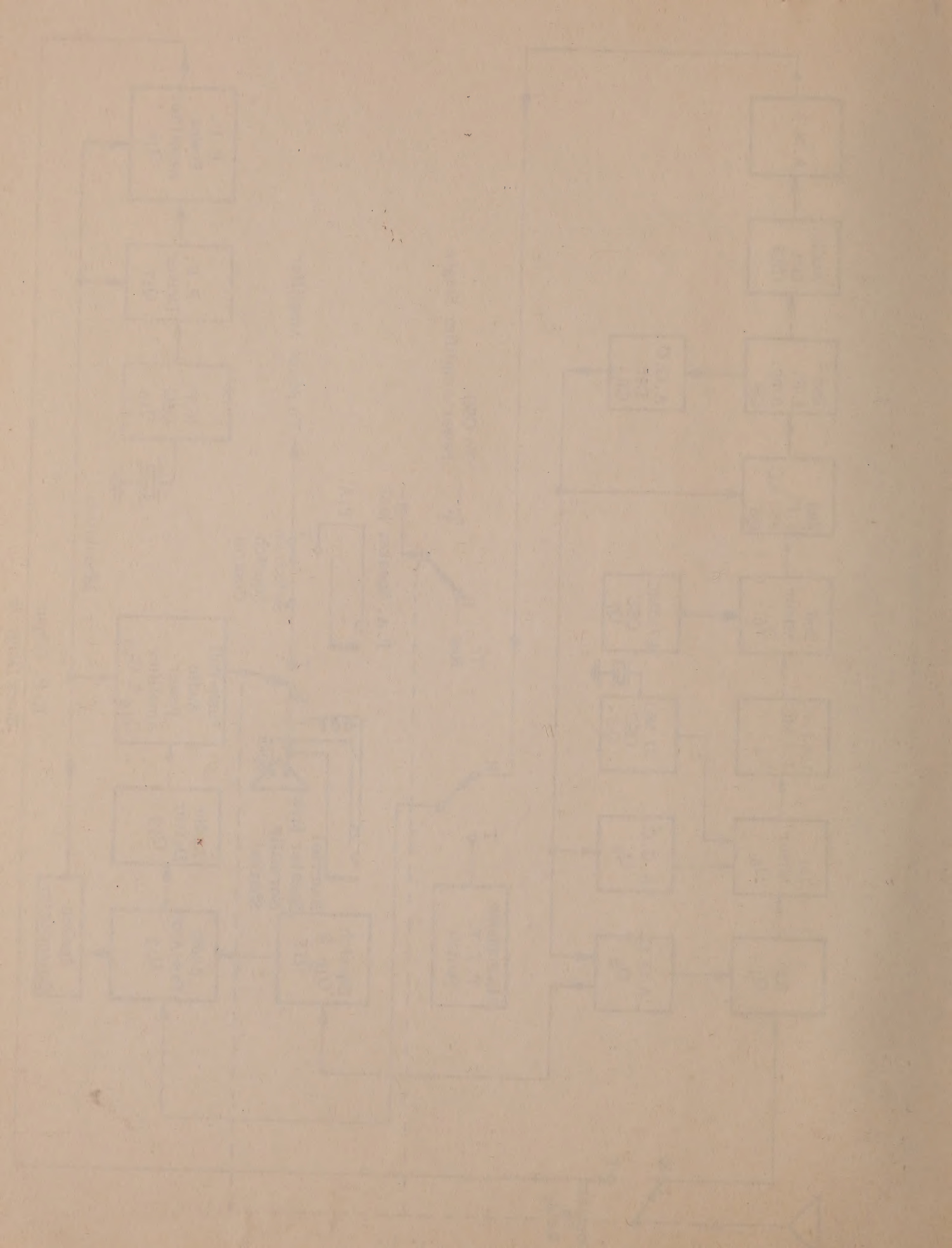
1. Before removing the original channel selector dial, it is advisable to make a list of the letters on the dial, and the channels to which they refer. For example; Letter A=Channel 1, B= Channel 3, etc.
2. Remove the die cut numbers from the card with tweezers, and place them on the new selector dial in the correct order using the list compiled in step 1. The die cut numbers are easily removed by bending the card at the perforations provided.
3. Loosen the set screws in the three front panel knobs and remove.
4. Remove the two nuts and washers on the two outside controls. The front panel can now be removed.
5. Remove the fiber washer from the shaft on the channel selector switch.
6. Loosen the set screw in the channel selector dial and remove it from the shaft.
7. Place the new channel selector dial on the shaft, and then insert the fiber spacing washer.
8. Replace the front panel and move the selector dial forward so it rests snugly against the washer.
9. Tighten the set screw in the channel selector dial against the flat side of the shaft.
10. Replace nuts, washers, and control knobs.

D. Dial Lamp Replacement

The dial lamp can be replaced by removing the front panel as outlined in step C above. Care should be exercised in the dial lamp replacement to prevent burning the teflon insulated connections on the chassis. Use a 30 or 40 watt iron.



Block Diagram
Figure 1



SECTION 3

RECEIVER TROUBLE SHOOTING - ALIGNMENT

Note:

The Messenger III Citizens Band Transceiver is carefully aligned at the factory. Complete re-alignment is not recommended except by technicians familiar with transistorized transceivers, and who have the necessary test equipment, and then only if absolutely necessary. Replacement of defective components in any stage may require re-alignment of that particular stage only. The following procedures are therefore outlined as a guide for trouble shooting, repair, and the necessary alignment required for proper maintenance of the Messenger III.

A. Equipment Required

Power Supply - 13.8 VDC regulated, 1 amp minimum - Power Designs Inc., Model 3240 or equivalent

Oscilloscope
A. C. VTVM - Heath Model AV-3 or equivalent
R. F. Generator - .455 to 30 MC with attenuated output of 1 microvolt to .1 volt capable of modulation at 1000 cps at 30% - Hewlett Packard 606A or equivalent.
Audio Signal Generator - 1000 cps - Heath Model AG-9A or equivalent
VTVM - Triplet Model 850 with RF Probe or equivalent
6DB pad - Connected to output of signal generator for the troubleshooting and alignment procedures.

B. Test Equipment Set Up (Figure 2)

The Messenger III Transceiver is "floated" above ground and care must be exercised in the test equipment connection. The test equipment called for in the equipment list will work satisfactorily if connected as shown in Figures 2, 3, and 4. The AC-VTVM and Oscilloscope connections may be made as shown in Figure 2, or a test cable may be used as shown in Figure 3. The D. C. Ammeter is connected to the power cable for transmitter readings as illustrated in Figure 4, and the jumper between pins 5 and 6 must be replaced when meter is not used. A test power cable may be made by obtaining E. F. Johnson part #023.1657-001 and inserting in the meter as shown. If an audio generator or VTVM other than the ones described in the equipment list is used, it must be isolated from ground. It may be necessary in the use of the audio generator, to place a capacitor in series with the ground lead as well as the hot lead. The R. F. signal generator used for the receiver tests and alignment is connected to the receiver through a 6DB pad for all measurements. In some instances the signal generator output may also be in series with a .1 mfd capacitor and this will be indicated where appropriate. The test equipment connection to the receiver for trouble shooting and alignment will be as follows, except where noted in text.

1. D. C. Supply connected to J1 through power cable part #023.1657-001.
2. AC-VTVM and Oscilloscope connected across speaker leads as in Figure 2 or Figure 3.
3. 6DB pad connected to output of R. F. Signal Generator.
4. The R. F. Signal Generator output is 1000 cps modulated at 30%. This can be internal modulation, as in the case of HP606A, or external modulation by a separate audio generator.
5. Receiver Alignment should be made on Channel 11 (27.085 MC).

C. Preliminary Receiver Checks

1. Connect test equipment to the receiver as illustrated in Figure 2.
2. Connect signal generator to the antenna input.
3. Set signal generator for a 1μ volt output on Channel 11 (27.085 MC).

C. Preliminary Receiver Checks (Cont.)

4. Turn volume control to maximum and squelch to minimum (CCW).
5. The current drain on the power supply for the receiver will be approximately 110 ma with a 13.8 volt D.C. power supply.
6. There should be at least +5db of audio across speaker, and other specifications should be obtained as listed in Section 1.

If these conditions are not met, recommended receiver checks may be made as outlined in the following text.

NOTE: The first check for trouble should be visual, then check emitter currents of the stages by dividing the voltage at the emitter by the emitter resistance - $Ie = \frac{Ve}{Re}$.

D. A.G.C. Section

The Messenger III utilizes a delayed, amplified A.G.C. system. A.G.C. is fed to the base of Q8 in the IF section, and to the bases of Q5 and Q2, the A.G.C. amplifiers. Q5 is in series with Q4, the first mixer, and Q2 is in series with Q1, the R.F. Amplifier. Since the A.G.C. may affect many stages, it is important to make checks on this stage first.

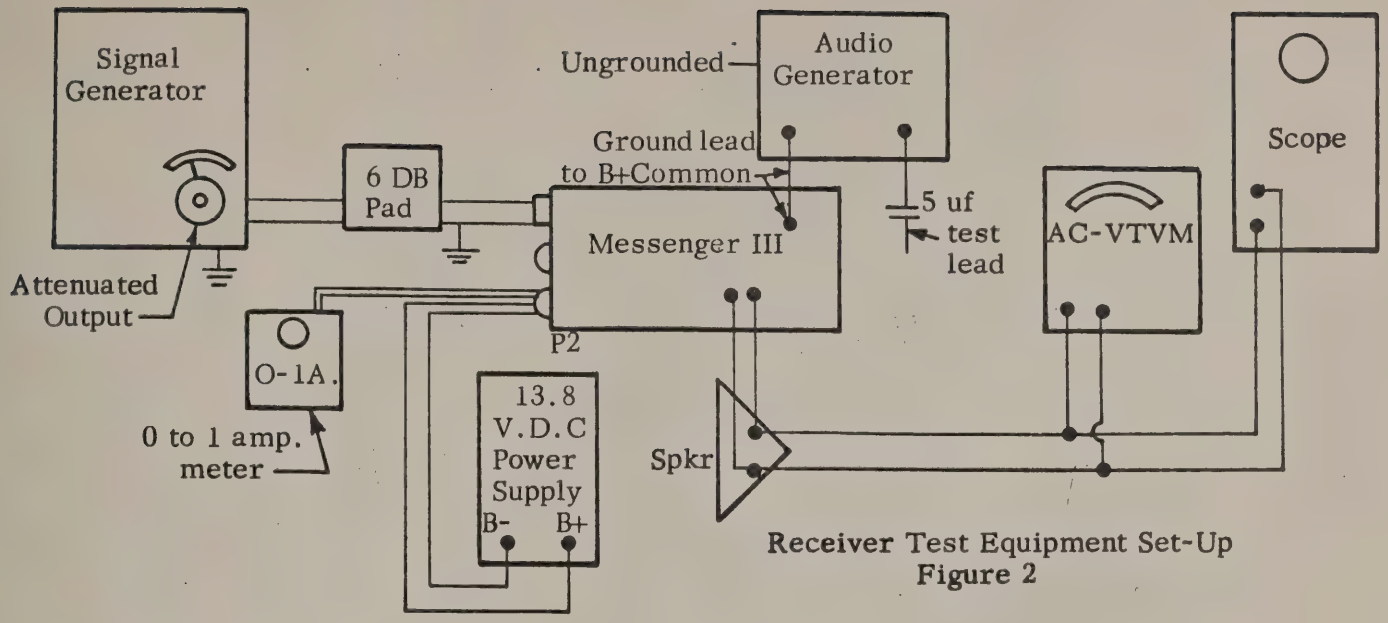
1. Absence of A.G.C. will cause:
   a. Severe overloading at high signal levels.
   b. Erroneous voltage readings at the bases of Q1, Q2, Q4, Q5, and Q8.
2. A.G.C. Section Troubleshooting
   a. Connect the R.F. Signal Generator to the antenna terminal with a 1μ volt output.
   b. Connect a VTVM to the junction of R21 and R23.
   c. Apply power to receiver.
   d. The A.G.C. voltage will go more positive as the input signal is increased from 1 microvolt to .1 volt. See figure 5 for a typical A.G.C. curve. (Audio output vs R.F. input) If there is no voltage change at this point, check the A.G.C. detector CR1 and its associated network.

E. Squelch Section Trouble Shooting

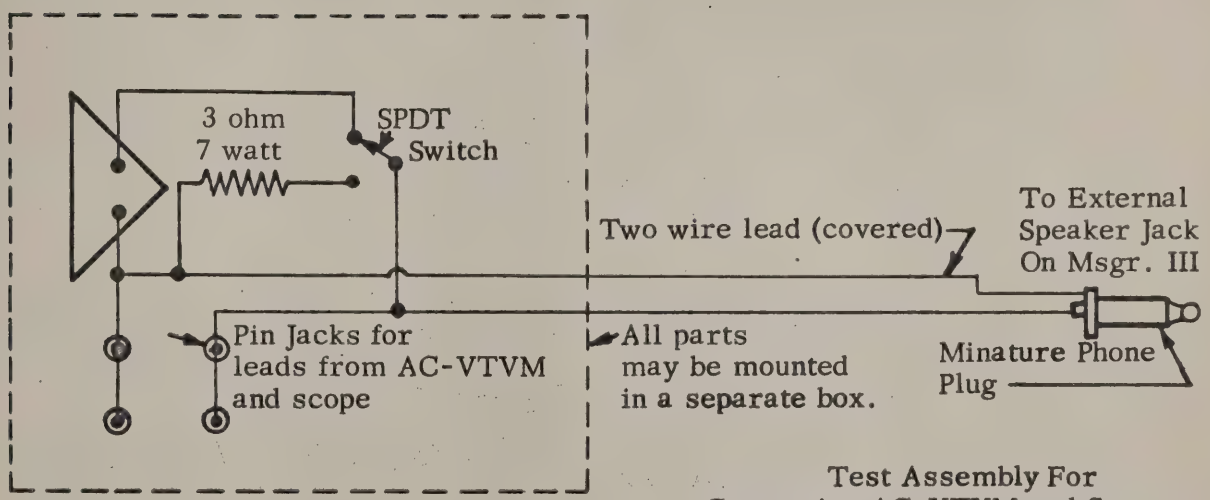
1. Connect a VTVM to the emitter of Q12. Apply power to the receiver.
2. While monitoring the VTVM, rotate the squelch control from minimum to maximum. The voltage should change from approximately -2.6 to -6.5 volts.
3. If the voltage does not change at Q12, check the diode CR6 by bridging it with a new part.
4. An open CR6 will result in no squelch at all, and no change in voltage at the emitter of Q12.
5. If CR6 was not open, check the voltages at Q10 and Q11. This will aid in determining the presence of a defective transistor.
6. If the diode CR6 is shorted, the voltage at Q11 will be normal and squelch will operate very slowly. The emitter of Q12 in this case would read very low at minimum squelch, and normal at maximum squelch. Check by replacing the diode.

F. Audio Section Trouble Shooting

1. Connect the audio generator thru a 5 mfd capacitor to the top of the volume control with an output of .0025 volts RMS ±10% at 1000 cps. (plus side to generator) The ground lead is connected to the common tie point. (B+)

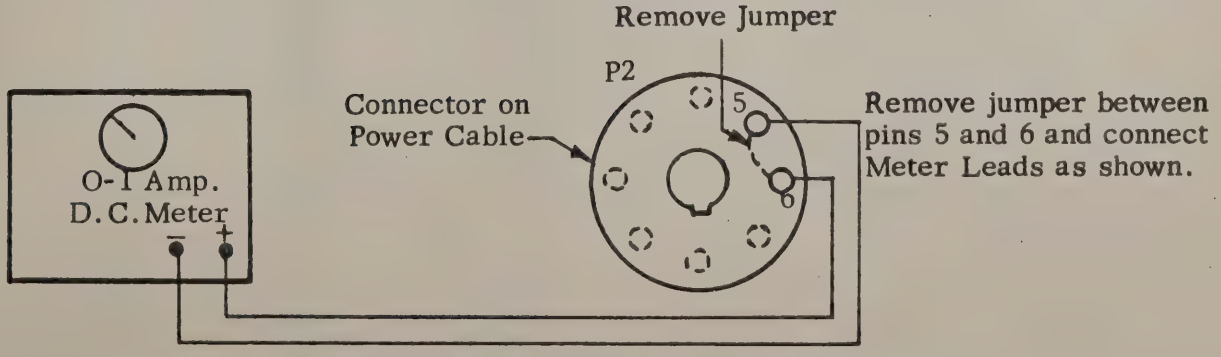


Receiver Test Equipment Set-Up
Figure 2


3 ohm 7 watt
SPDT Switch
Two wire lead (covered)
To External Speaker Jack On Msgr. III
Pin Jacks for leads from AC-VTVM and scope
All parts may be mounted in a separate box.
Minature Phone Plug

Test Assembly For
Connecting AC-VTVM and Scope

Figure 3



D.C. Ammeter Connection to Power Cable
Figure 4

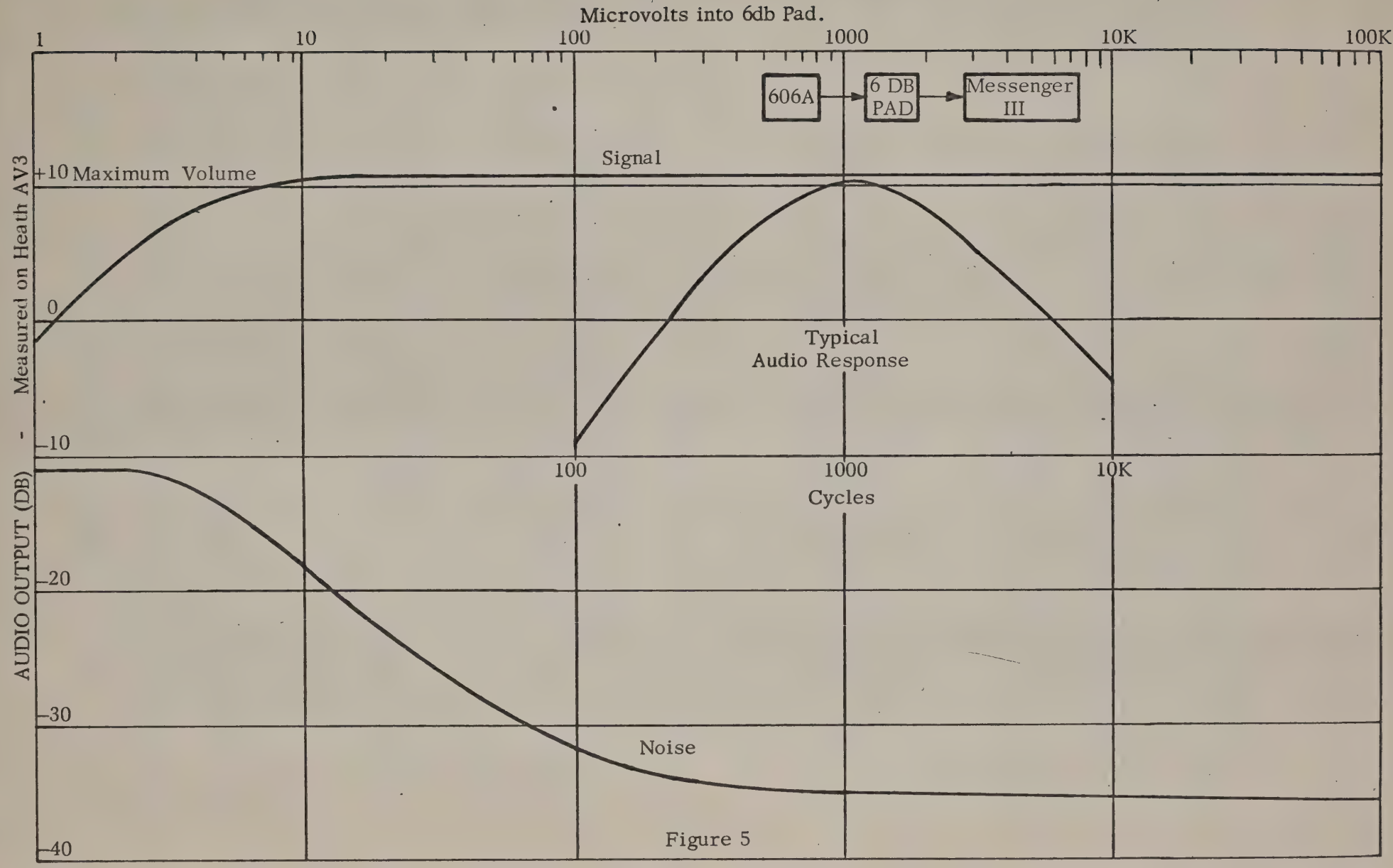

Microvolts into 6db Pad.
1
10
100
1000
10K
100K
606A
6 DB PAD
Messenger III
Signal
+10 Maximum Volume
0
-10
Measured on Heath AV3
Typical Audio Response
100
1000
10K
Cycles
AUDIO OUTPUT (DB)
-20
-30
-40
Noise

Figure 5

F. Audio Section Trouble Shooting (cont'd)

2. Set audio control for +10db on the AC-VTVM and turn squelch to minimum. (CCW)
3. The output as monitored on the AC-VTVM and scope, should be approximately +10db undistorted. If this condition is not met, check the currents in stages Q12, Q13, Q14, and Q15. (Emitter current = emitter voltage/emitter resistance)
4. The voltages at the emitter and base of the push-pull transistors (Q14 and Q15) should be approximately the same. If one of the transistors shows no voltage difference between the emitter and base, it is probably defective. It would be best to remove the transistor and check it.
5. Parts replacement in Audio Stage
   Replacement of Q14, Q15, R58, C51, C57, or CR5 will require the removal of L8 in order to gain access to these components. L8 is mounted on the side of the chassis and held in place by two screws.

Notes on the Push-Pull Stage

An open transistor in this stage would be evidenced by severe audio distortion. A shorted transistor will cause R58 to burn and possibly blow a fuse. It may be possible to find the defective transistor by determining which has an excessively hot case. It is adviseable to remove the transistors and check them with a good transistor tester and replace the defective part.

G. 2nd I.F.

1. Connect test equipment as specified in Part B.
2. Trouble-Shooting
   a. Apply power to receiver, set volume control for +10db on AC-VTVM and turn squelch to minimum.
   b. Set the modulated RF Signal Generator to 455 KC with an output of 200 micro-volts.
   c. Connect a .1 mfd capacitor in series with the output of the signal generator.
   d. Connect the output of the signal generator to the base of Q6. There should be approximately +10db of undistorted audio across the speaker terminals.
   e. If the output is weak or distorted, check the I.F. stage voltages as well as the detector diode, CR2, and the noise limiter, CR3.
3. Alignment
   a. Alignment is necessary only in the particular stage in which an I.F. transformer was replaced.
   b. Inject the modulated 455 KC signal as previously specified to the base of Q6. Ground the signal generator to the chassis rails.
   c. Tune the 2nd I.F. stage to the outside peak on both the top and bottom slugs as viewed from the top and bottom of the chassis respectively.

H. 1st I.F. Section

1. Connect the test equipment as specified in Part B.
2. Trouble Shooting
   a. Set the modulated R.F. signal generator to 4.3 MC with an output of 100 microvolts and ground the signal generator to the chassis rails.
   b. Connect the signal generator to the base of Q4 thru a .1 mfd capacitor.
   c. The output across the speaker leads should be approximately +10 db of undistorted audio.
   d. If these conditions are not met, check the transformer L4 and the voltages at Q6 and Q7. Replace the defective components as necessary.

SECTION 3
RECEIVER TROUBLE SHOOTING - ALIGNMENT

H. 1st I.F. Section (Cont'd.)

3. Alignment
   If the replacement of L4, Q6, or Q7 was required, re-align L4 as follows:
   a. Inject a modulated 4.3 MC signal to the base of Q4 thru a .1 mfd capacitor as above.
   b. Tune the bottom slug of L4 to the outside peak as viewed from the bottom of the receiver, to obtain maximum output on the AC-VTVM.
   c. Tune the top slug to the outside peak as viewed from the top of the receiver to obtain maximum output on the AC-VTVM.

I. R.F. Amplifier - 1st Mixer

1. Connect test equipment as outlined in Part B.
2. Trouble Shooting
   a. Set signal generator to 27.085 MC (channel 11) and connect it to the antenna input.
   b. Set the modulated R.F. signal generator attenuator for a 1 microvolt output.
   c. With maximum volume, the output read across the speaker terminals on the scope and AC-VTVM, should be at least +5 db undistorted audio.
   d. If the receiver output is not normal, check the emitter of the oscillator, Q4, with an R.F. probe. There should be approximately .2 volts R.F. at this point.
   e. If the oscillator operation appears normal, check the voltages at Q1 and Q4 and replace if necessary.
   f. Should it become necessary to replace either L1 or L2, proceed with the following alignment.
3. Alignment
   a. If L2 is replaced, connect the R.F. signal generator to the antenna jack with a 1 microvolt output on channel 11.
   b. Peak L2 at point where the slug is nearest the top of the coil form.
   c. If L1 was replaced, turn the slug to the second peak as viewed from the top of the receiver.
   d. Note the db reading on the AC-VTVM after peaking L1, and detune this transformer (turn counter-clockwise) for the best signal to noise, this may be 1 1/2 to 3 db removed from the peak gain.

SECTION 4
TRANSMITTER TROUBLE-SHOOTING

The following procedure is suggested as a guide for easy and quick trouble analysis of the Messenger III transmitter.

A. Equipment required

D. C. Power Supply - low transient regulated at 13.8 volts. Power Designs Inc. Model 3240.
Oscilloscope - with R.F. pickup loop capable of direct connection to the vertical plates - see figure 6.
0-1 Amp D. C. ammeter - Connect to power cable as shown in Figure 4.
Dummy Antenna - 50 ohms, 5 watts
Sine-Wave Generator - 1000 cps, -40 db or higher

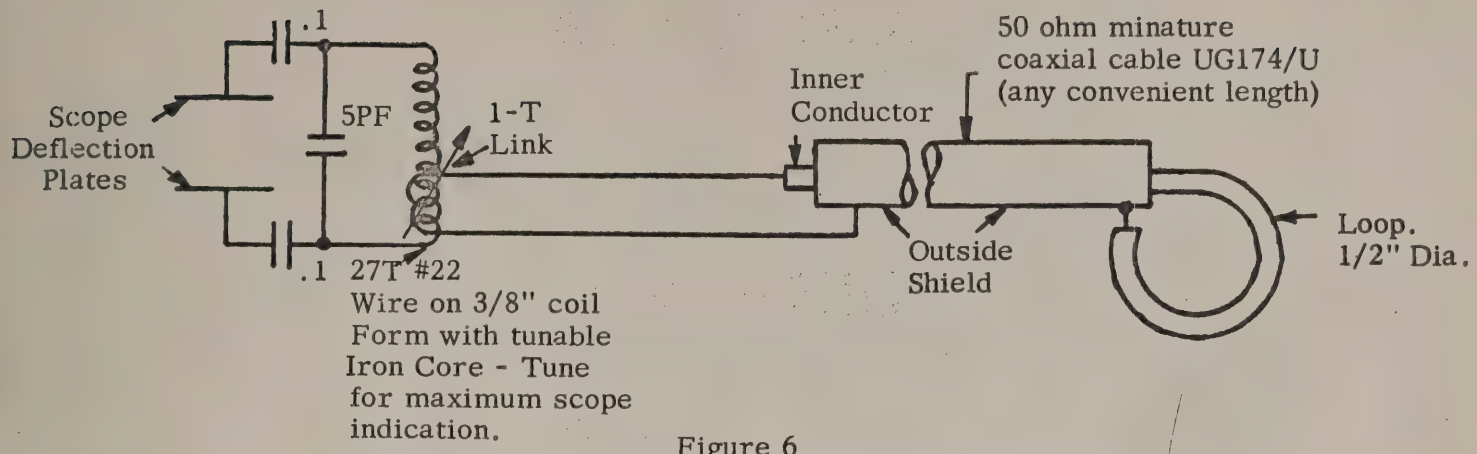


Figure 6
Oscilloscope R. F. Pick-up Loop and Method of Connection

B. Test Equipment Set-Up (Figure 8)

1. R. F. pick up loop is coupled to desired stage to be checked.
2. Connect the 0-1 amp meter in series with pins 5 and 6 of the power plug P2. These pins are jumpered in the plug as shown on the schematic. Be sure to replace this jumper when the meter is removed. See Figure 4.
3. Connect a 50 ohm dummy antenna.
4. Connect audio generator with .007 volts output thru .1 blocking capacitor to pins 4 and 5 of plug P3. (Pins 4 and 5 are jumpered, connect to jumper.) Connect ground side of generator to pin 6 of P3. See Figure 7.
5. Connect D. C. power supply
6. Turn transceiver on and set channel selector to channel 11.

C. Preliminary Transmitter Check

1. Key the transmitter and check for an output of 3 watts minimum.
2. Feed in the 1000 cps audio and monitor the output wave form on the scope. The output should be a clean sine wave. If the results of these checks show a defective transmitter, continue with the following procedure.

D. Initial Transmitter Adjustments

1. If the transmitter output is low, change the transmitter current with L16, and peak power output with C79, to obtain desired power point as shown in Figure 10.
2. When transmitter output is peaked to normal, modulate carrier with .007 volts, 1000 cps sine wave and check for "notching". (See Figure 9) If "notching" is present, or normal transmitter output cannot be obtained, preceed with the trouble shooting and alignment instructions.

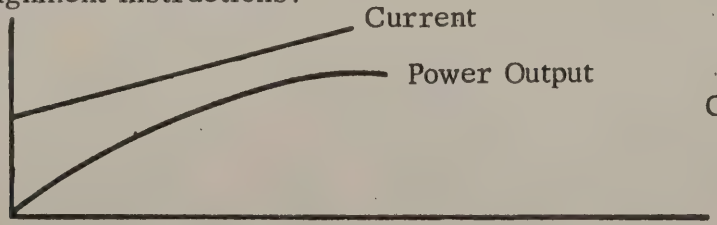
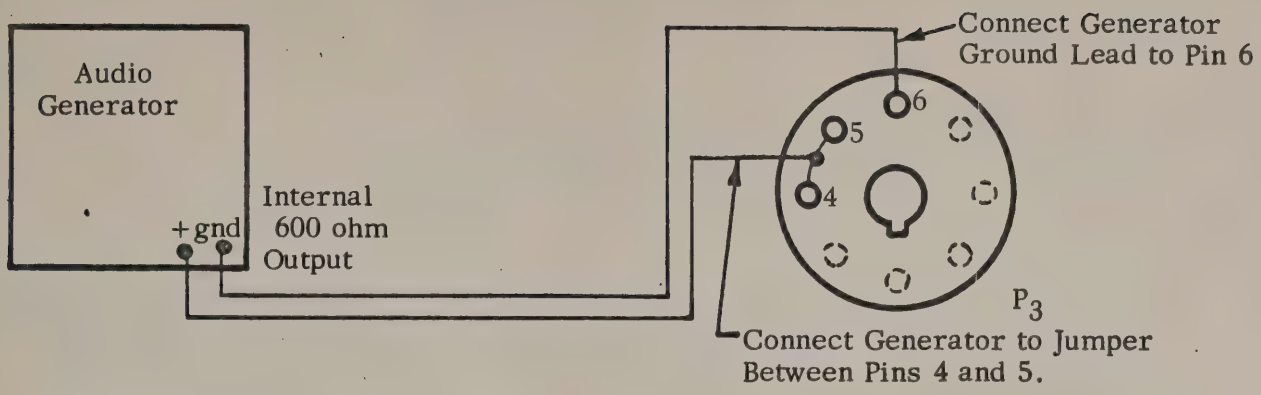


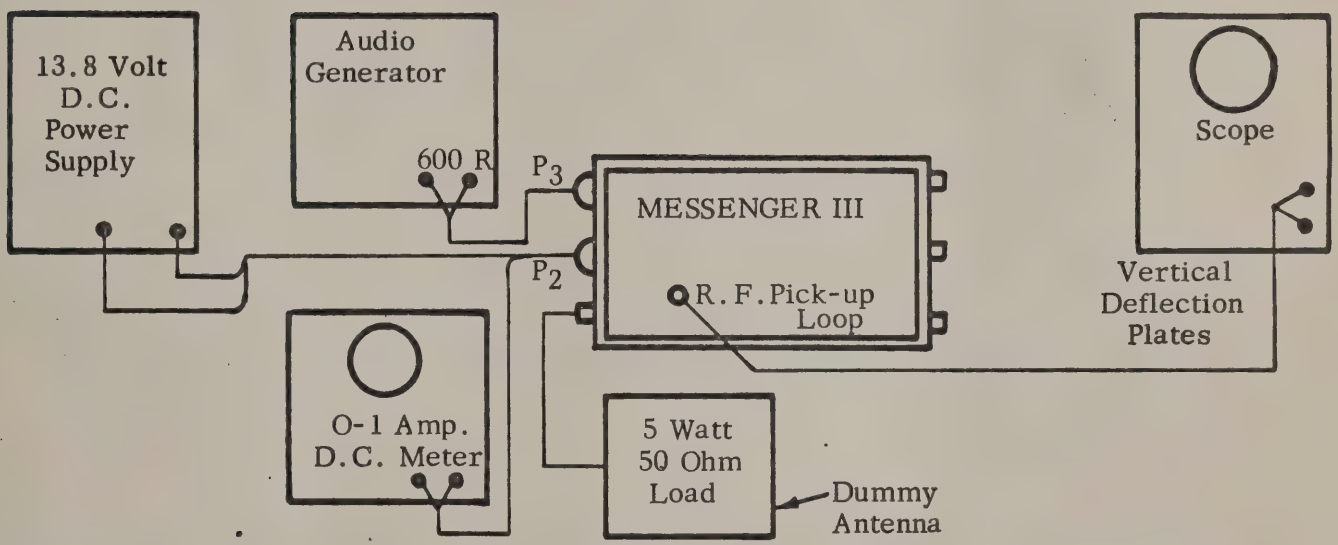
Figure 10
Transmitter
Current - Power Curve

E. Oscillator Stage

1. Trouble-Shooting
   a. Key the transmitter and check for normal power output.



Audio Generator Connection to P_3.
Figure 7



Transmitter Test Equipment Set-Up
Figure 8

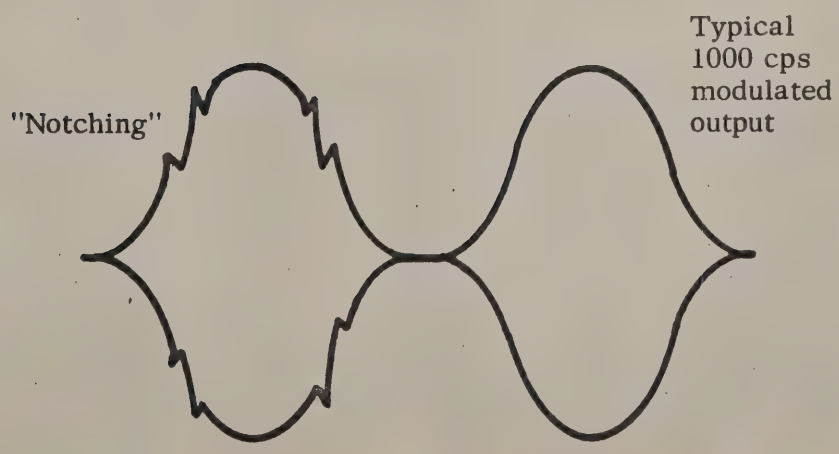


Figure 9

E. Oscillator State (Cont'd.)

b. If the transmitter is inoperative, check the oscillator stage using the scope and R. F. pickup loop. A citizens band receiver may also be used to make a quick check of the oscillator. If no R. F. is present, check the voltages on Q16 and replace components as necessary.

2. Alignment
   a. If replacement of the transistor, Q16 was required, it may be necessary to realign L11 to assure oscillator starting on all channels. Note: With no crystal in channel B, switch capacity may couple the channel A crystal to this position and cause oscillation. This is normal. A crystal installed in channel B will operate normally.
   b. Check for absence of "notching" while modulating transmitter. (See Figure 9). If "notching" is present, refer to Section 4, Part H.

F. Driver Stage

1. Trouble Shooting
   a. Key the transmitter, if power output is low after adjustment of C79 in part D, check driver stage with R. F. pickup loop.
   b. If R. F. is low at this point, check the voltages in this stage and replace defective components as necessary.
2. Alignment
   a. If replacement of Q17 and L12 was necessary, re-alignment of this stage may be required.
   b. Adjust L12 for maximum power output. This is a broad adjustment, tune for center of maximum.
   c. Again check transmitter output with scope while modulating carrier with 1000 cps sine wave, to be sure there is no "notching". If "notching" is present, refer to Section 4, Part H.

G. Power Amplifier Stage (P. A.)

1. Trouble Shooting
   a. Key transmitter - normal power output is approximately 3 watts minimum.
   b. If C79 does not affect output power, and the driver stage is normal check voltages at Q18 and replace components as necessary.
   c. Replacement of Q18, L15, or C79 may require re-alignment of the P. A. Stage.
2. Alignment
   a. If L15 was replaced, adjust the slug to 1/8" from being flush with the top of the coil form. Then proceed as follows. Note - Do not touch L15 unless it has been replaced.
   b. Key transmitter and adjust C79 for maximum power output.
   c. Check P. A. current. If the current goes over 400 ma when C79 is peaked, retune L16 for less than 400 ma, and readjust C79 for maximum power output. Repeat these adjustments for a minimum of 3 watts output at 400 ma or less.

H. "Notching" - (Due to mis-tuning) Figure 9

1. Key transmitter and modulate carrier at 1000 cps while monitoring the transmitter output on scope as outlined in Part C.
2. While transmitter is keyed, tune L11 until "notching" disappears and the audio wave is symetrical. If L11 does not eliminate the "notching", it may also be necessary to make a slight adjustment of L12. Re-check oscillator starting on all crystals as noted in part E-2 above.

MESSENGER III

PARTS LIST

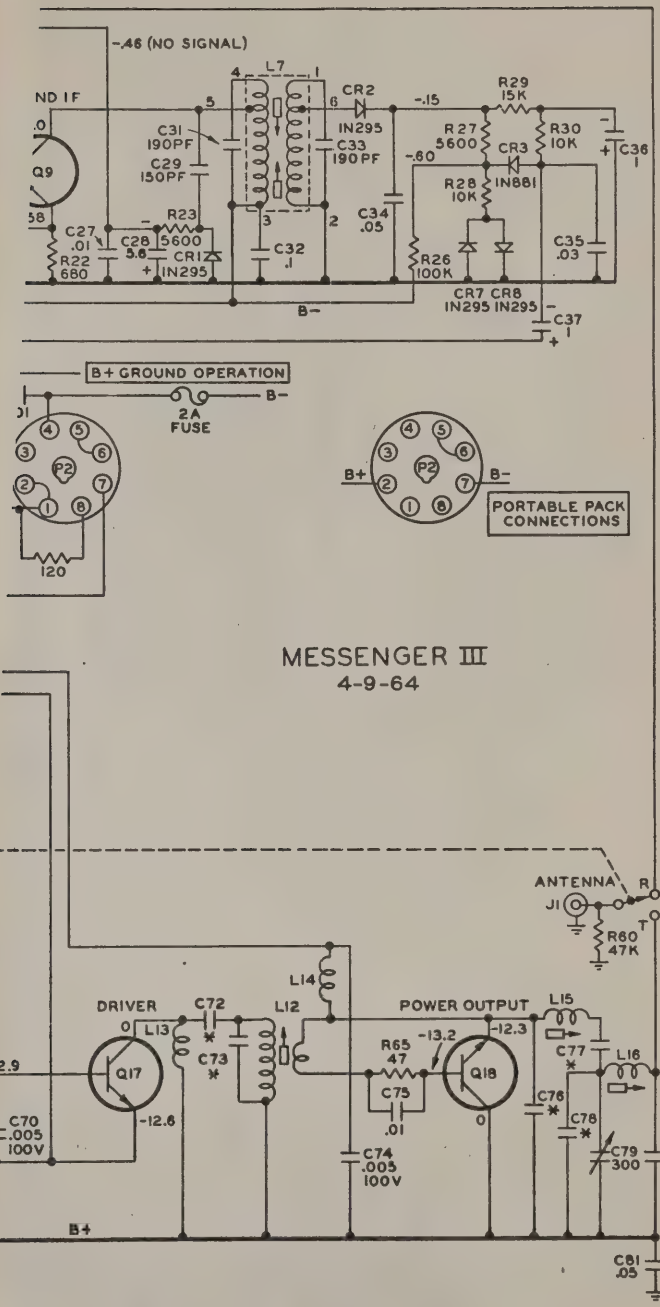
Item No.	Description	Part No.
C1, 66	.005 ± 20% MF - 125 VAC disc capacitor	510-3001-502
C2, 6	100 pf ± 5% N750 disc ceramic capacitor	510-3020-101
C3, 4, 5, 8, 9, 19, 24, 25, 27, 42, 43, 48, 49, 56, 75	.01 + 80%/-20% MF-50 volt capacitor	022.1966-010
C11	330 ± 5% pf N750 - 200 volt capacitor	510-3020-331
C12	430 ± 5% pf N750 - 200 volt capacitor	510-3020-431
C13, 18, 58	.01 ± 20% MF-50 volt capacitor	510-3002-103
C14, 15, 34	.05 + 80%/-20% MF - 25 V. - Y5U capacitor	510-3007-503
C10	.22 ± 20% MF-50 volt capacitor	510-3051-224
C16	330 ± 5% pf capacitor	510-3014-331
C17	270 ± 5% pf capacitor	510-3014-271
C22, 23, 31, 33	190 ± 5% pf N080 - 200 volt capacitor	510-3015-191
C21, 26	.22 + 80%/-20% MF-3 V. capacitor	510-3009-224
C28, 52, 62	5.6 MF - 35 V. capacitor	510-2005-569
C29, 45	150 ± 10% pf - 50 V. capacitor	022.1803-001
C30, 61	50 +100%/-10% MF - 15 V. capacitor	022.2354-050
C32, 54	.1 + 80%/-20% MF - 25 V. capacitor	510-3007-104
C35	.03 ± 20% disc capacitor	510-3002-303
C20, 36, 37	10MF - 35 V. capacitor	510-2005-109
C39	18 pf ± 5% N750 disc ceramic capacitor	510-3020-180
C40	6.8 ± 5% pf - NPO capacitor	510-3013-689
C41	39pf ± 5% N750 disc ceramic capacitor	510-3020-390
C46	.001 ± 20% MF disc capacitor	510-3002-102
C47	68 ± 5% pf N150 disc capacitor	510-3016-680
C51, 57, 63, 53	.02 ± 20% MF - 50 V. capacitor	510-3002-203
C55	900 + 100%/-10% MF - 15 V. capacitor	022.2354-900
C59	22 MF - 15 V. capacitor	510-2003-220
C60	22 ± 5% pf - NPO disc capacitor	510-3013-220
C64, 50	56 MF - 6 V capacitor	510-2001-560
C67	22 pf ± 5% NPO disc ceramic capacitor	510-3013-220
C68	150 pf ± 5% N750 disc ceramic capacitor	510-3020-151
C69, 70, 71, 74	.005 + 80%/-20% MF - 500 V. capacitor	022.0827-001
C72	47 pf ± 5% NPO disc ceramic capacitor	510-3013-470
C73	33 pf ± 5% N150 disc ceramic capacitor	510-3016-330
C76	27 pf ± 5% NPO disc ceramic capcitor	510-3013-270
C77	100 pf ± 5% N150 disc ceramic capcitor	510-3016-101
C79	#427 mica compression variable capacitor	022.2322-012
C80	330 pf ± 5% V. mica capacitor	022.4061-005
C81, 82, 38, 44	.05 +80%/-20% MF - 50 V. capacitor	022.1966-050
C78	220 pf ± 5% 500 V. mica capacitor	022.4057-005
CR1, 2, 6, 7, 8	1N295 diode	022.3901-001
CR3, 4, 9	1N881 diode	022.3905-001
CR5	1N2326 diode	022.3902-001

Item No.	Description	Part No.
CH3	Overlay assembly	023.1694-001
CH4	Channel indicator assembly	023.1645-001
CH6	Cabinet assembly	023.1643-001
CH7	Dash mounting bracket assembly	023.1648-001
E2	Heat sink base	016.1539-001
E3	Heat sink cover	016.1540-001
E4	Crystal contact	016.1019-001
E5	Heat sink	013.1074-001
E6	Insulating Washer	022.1763-001
E7	Insulator	018.0817-001
E8	Feed-thru body	018-0825-001
E9	Feed-thru contact	013-1077-001
G1	Rubber Grommet	022.2319-001
G2	1/4" cable clamp	022.1276-004
I1	Subminature Lamp, White, 12V	022.2317-001
I2	Subminature Lamp, Red, 12V	022.2317-002
J1	Antenna Jack	022.0746-001
J2	8 pin male plug (with ring)	022.1365-006
J3	11 pin male plug (with ring)	022.1676-001
J4	Phono jack	022.1946-001
J5	Phono jack (circuit opening)	022.1946-002
L1	27 MC - input transformer	022.1788-001
L2	27 MC - output transformer	022.1788-002
L3	27 MC - oscillator transformer	022.1788-003
L4	4.3 MC - interstage transformer	022.1788-004
L5	455 KC - input transformer	022.1789-005
L6	455 KC - interstage transformer	022.1789-006
L7	455 KC - output transformer	022.1789-007
L8	20 mhy. filter choke	022.1947-001
L11	Oscillator coil	022.2342-001
L12	Driver coil	022.2342-002
L13, 14	13 Microhenry coil	022.1944-130
L15	Series output coil	022.2321-010
L16	Pi-output coil	022.2321-004
M	Microphone	022.1949-001
MP1	Channel selector shaft index assembly	022.1934-002
MP2	Bulb clip	022.2316-001
MP3	Front panel die casting	015.0722-003
MP4	Knobs	022.1929-001
MP5	Speaker post	014.0031-081
MP6	Speaker post with holes	014.0564-002
P2	11 pin jumper plug	023.1659-001
Q1	2N1177 R.F. transistor	022.3511-770
Q2, 5, 8, 9	2N1638 I.F. transistor	022.3516-380
Q3, 7	2N1178 oscillator transistor	022.3511-780
Q4, 6	2N1179 mixer transistor	022.3511-790
Q10	2N404 squelch transistor	022-3504-040
Q11, 12	2N406 audio transistor	022.3504-060
Q13	2N591 driver transistor	022.3505-910
Q14, 15	40050 audio output transistor	022.3640-050
Q16	40080 oscillator transistor	022.3640-080
Q17	40081 driver transistor	022.3640-081

MESSENGER III
PARTS LIST (Cont'd.)

Item No.	Description	Part No.
Q18	40082 power output transistor	022.3640-082
R1,3,7,60	47,000 ±10% ohm 1/4 W. resistor	022.5589-010
R2,51	3900 ±10% ohm 1/4 W. resistor	022.5563-010
R4,22,33	680 ±10% ohm 1/4 W. resistor	022.5545-010
R5,56,52,32	470 ±10% ohm 1/4 W. resistor	022.5541-010
R6,9,18,36,	4700 ±10% ohm 1/4 W. resistor	022.5565-010
R11,50	39,000 ±10% ohm 1/4 W. resistor	022.5587-010
R13,8,12,17,16	1000 ±10% ohm 1/4 W. resistor	022.5549-010
34,35,39,41,44		
R14,21	8200 ±10% ohm 1/4 W. resistor	022.5571-010
R15	220,000 ±10% ohm 1/4 W. resistor	022.5605-010
R57	1500 ±10% ohm 1/4 W. resistor	022.5553-010
R19	27,000 ±10% ohm 1/4 W. resistor	022.5583-010
R23,27,24	5600 ±10% ohm 1/4 W. resistor	022.5567-010
R26	100,000 ±10% ohm 1/4 W. resistor	022.5597-010
R20	6800 ± 10% ohm 1/4 W. resistor	022.5569-010
R37,29	15,000 ±10% ohm 1/4 W. resistor	022.5577-010
R38,46,31	3300 ±10% ohm 1/4 W. resistor	022.5561-010
R40	10,000 ohm potentiometer with SPST switch	022.1933-001
R43	5,000 ohm potentiometer with SPDT switch	022.1933-002
R45,49,30,28	10,000 ±10% ohm 1/4 W. resistor	022.5573-010
R59	22 ±10% ohm 1/4 W. resistor	022.5509-010
R48,65	47 ±10% ohm 1/4 W. resistor	022.5517-010
R42	330,000 ±10% ohm 1/4 W. resistor	022.5609-010
R54	2700 ±10% ohm 1/4 W. resistor	022.5559-010
R55	330 ±10% ohm 1/4 W. resistor	022.5537-010
R58	1 ±10% ohm 1/2 W. resistor	022.8025-010
R61	510 ±5% ohm 1/4 W. resistor	022.5542-005
R62	5100 ±5% ohm 1/4 W. resistor	022.5566-005
R63	51 ±5% ohm 1/4 W. resistor	022.5518-005
R64	120 ±10% ohm 1/4 W. resistor	022.5527-010
RY	Relay	022.1936-001
R53	33,000 ± 10% ohm 1/4 W. resistor	022.5585-010
LS	3" x 5" speaker	022.1938-001
SW	Printed circuit switch	022.1934-001
T1	Driver Transformer	022.1904-001
T2	Output - modulation transformer	022.1905-001
XY	Relay socket	022.1937-001
YR	4.755 MC crystal	022.2337-001
	Schematic	025.0644-001
	Part 19 - FCC Rules - Citizens Radio Service	022.1635-001
	FCC Form 505 - License Application form	022.1636-001
	"Messenger 2-Way Radio" sticker	022.1908-001
	FCC Identification card	022.1598-004
	Warranty registration card	041.0419-005
	Spare fuse, AGC-2, 2 amp. 250 volt	022.1257-001
	Microphone holder	022.1637-001
	Screws for microphone holder	011.0811-012
	Microphone mounting tape	022.2500-001
	Microphone mounting tape	022.2500-002
	Replacement channel indicator assembly (numbers)	023.1646-001
	Channel number stickers	022.2327-001
	Plug buttons	537-9001-004

TRANSCEIVER PART NO.	CHANNEL	OPERATING FREQUENCY MEGACYCLES	Y2 TRANSMITTER CRYSTAL PART NO.	Y1 RECEIVER CRYSTAL PART NO.
242-0150-001	1	26.965	022.1942-001	022.1942-101
-002	2	26.975	-002	-102
-003	3	26.985	-003	-103
-004	4	27.005	-004	-104
-005	5	27.015	-005	-105
-006	6	27.025	-006	-106
-007	7	27.035	-007	-107
-008	8	27.055	-008	-108
-009	9	27.065	-009	-109
-010	10	27.075	-010	-110
-011	11	27.085	-011	-111
-012	12	27.105	-012	-112
-013	13	27.115	-013	-113
-014	14	27.125	-014	-114
-015	15	27.135	-015	-115
-016	16	27.155	-016	-116
-017	17	27.165	-017	-117
-018	18	27.175	-018	-118
-019	19	27.185	-019	-119
-020	20	27.205	-020	-120
-021	21	27.215	-021	-121
-022	22	27.225	-022	-122
-023	23	27.255	-023	-123



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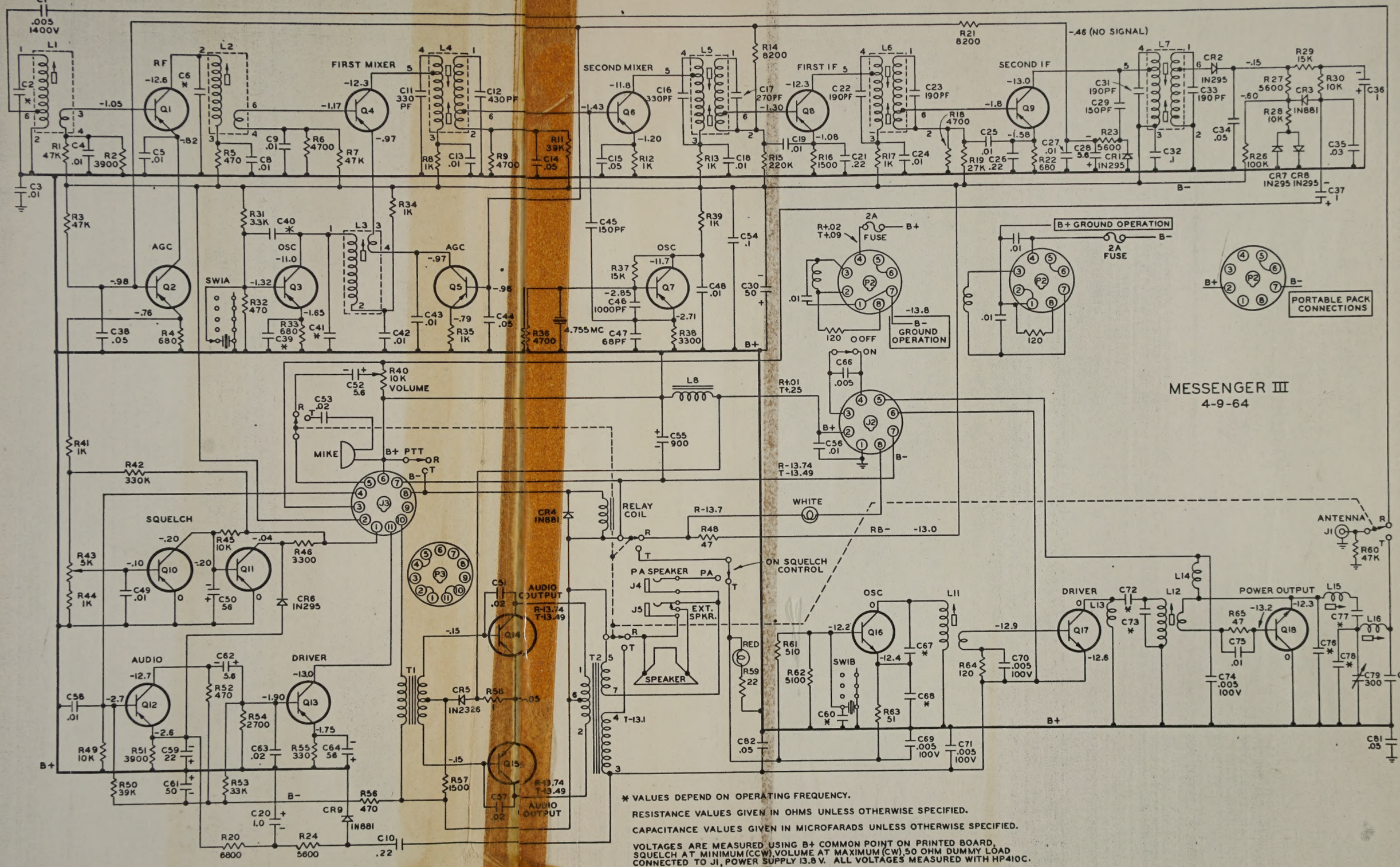

* VALUES DEPEND ON OPERATING FREQUENCY.

RESISTANCE VALUES GIVEN IN OHMS UNLESS OTHERWISE SPECIFIED.

CAPACITANCE VALUES GIVEN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

VOLTAGES ARE MEASURED USING B+ COMMON POINT ON PRINTED BOARD, SQUELCH AT MINIMUM (CCW), VOLUME AT MAXIMUM (CW), 50 OHM DUMMY LOAD CONNECTED TO J1, POWER SUPPLY 13.8 V. ALL VOLTAGES MEASURED WITH HP410C.

P INPUT = V_{CE} I_C = 12.3 X .405 = 5 WATTS MAX.

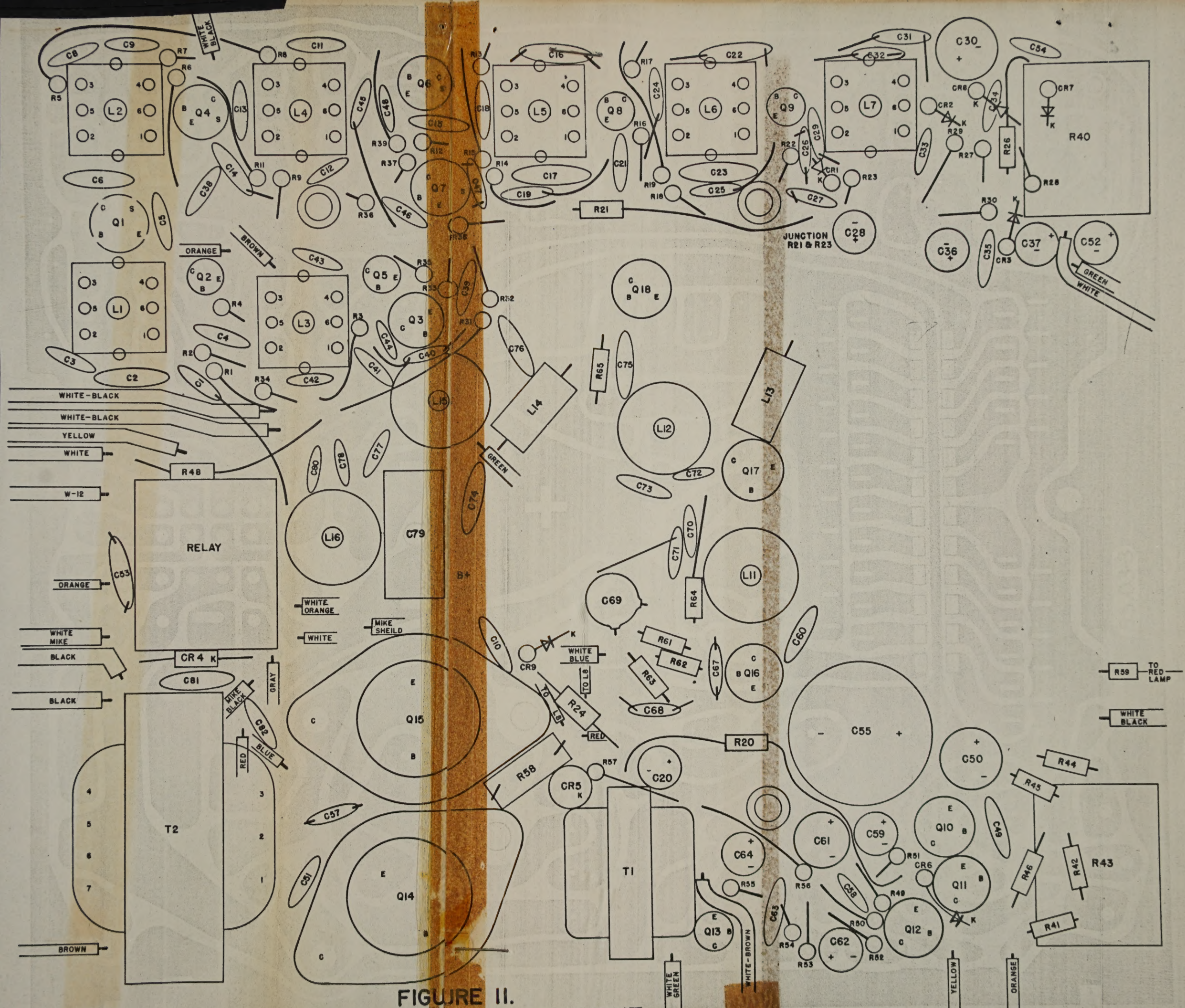

FIGURE 11.
PRINTED CIRCUIT PARTS LAYOUT